



Short Film
The Biology of Skin Color

hhmi | BioInteractive

Quiz
Student Handout

NAME _____

DATE _____

1. True / False. Biologists classify specific forms of traits as good or bad. For example, long tails in cats could be classified as good and short tails as bad. (Circle the correct response.)
2. Explain the reasoning or evidence you used to answer Question 1.
3. If you travel north from the equator, what generally happens to the intensity of ultraviolet (UV) light?
 - a. The intensity increases.
 - b. The intensity decreases.
 - c. The intensity stays the same.
 - d. It is impossible to predict.
4. Who would you expect to be most at risk for developing the bone disease rickets?
 - a. Children born to mothers with dark skin, living far from the equator
 - b. Adults with dark skin who live close to the equator
 - c. Children born to mothers with light skin, living close to the equator
 - d. Adults with light skin who live close to the equator
 - e. Anyone who eats a diet that includes a lot of fish
5. Explain the reasoning or evidence you used to answer Question 4.
6. When Dr. Nina Jablonski describes her discovery of the UV data collected by NASA, a headline is visible that reads, "Ozone Depletion Raising Risk of Skin Cancer, Scientist Says." Use this headline and your understanding of what causes skin cancer to infer a beneficial feature of the ozone layer for humans. Why would a depleted ozone layer increase the risk of skin cancer?



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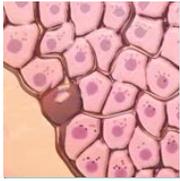
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7. Ultraviolet light can cause mutations and other damage within cells, which can hurt an individual's chance of surviving and leaving offspring. Some molecules can protect cells from damage by UV. The amount of these molecules is determined by genes. Within a population, some individuals make more of these UV-protection molecules than others.

What do you predict would happen to the frequency of the genes that cause more of the molecules to be made in a population over time? Assume all other factors are equal.

- The frequency would increase because individuals need the genes.
 - The frequency would increase because individuals with the genes for more molecules would leave more offspring.
 - The frequency would decrease because molecules are types of chemicals, and having more chemicals in the body is harmful.
 - The frequency would stay the same because populations do not change over time.
8. Write down the evidence or reasoning you used to answer Question 7.
9. Describe your ideas about why indigenous groups of people in different parts of the world have different skin colors from other groups of people.

10. Describe at least three different types of evidence that support your ideas for Question 9.



Use the following scenario to answer Questions 11 and 12.

A biologist was studying two indigenous groups of people from different areas of the world. The first population was from equatorial Africa. The second population was from northern Europe. The biologist was studying a gene that affects skin color. The biologist examined the gene in 100 people from each population. She kept track of how many different forms (or alleles) of the gene she found in each population. The results are in the graph in Figure 1.

11. Describe the major pattern in the data in Figure 1.

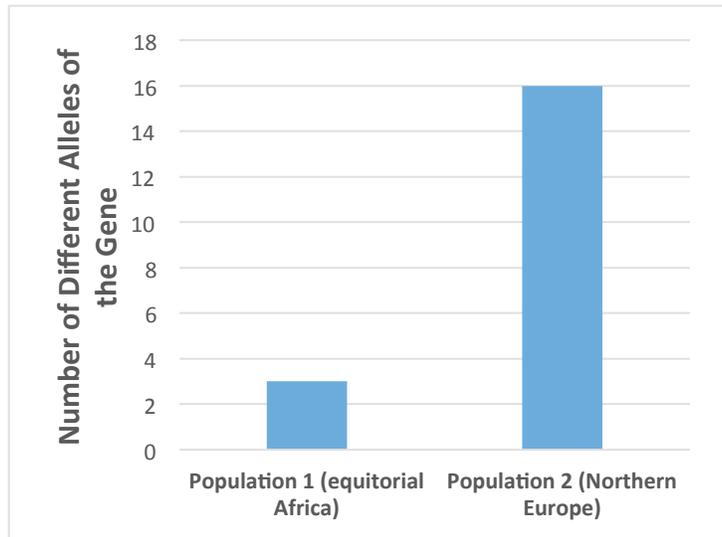
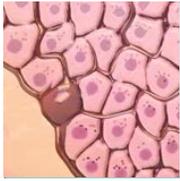


Figure 1.

12. Make a claim about the strength of stabilizing natural selection on this gene in the two populations. Use evidence from the graph (Figure 1) to support your claim.

13. Describe how having dark skin may have provided an advantage in survival and reproduction to people thousands of years ago in some places in the world but not in others.

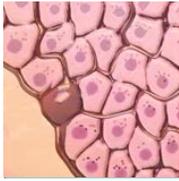


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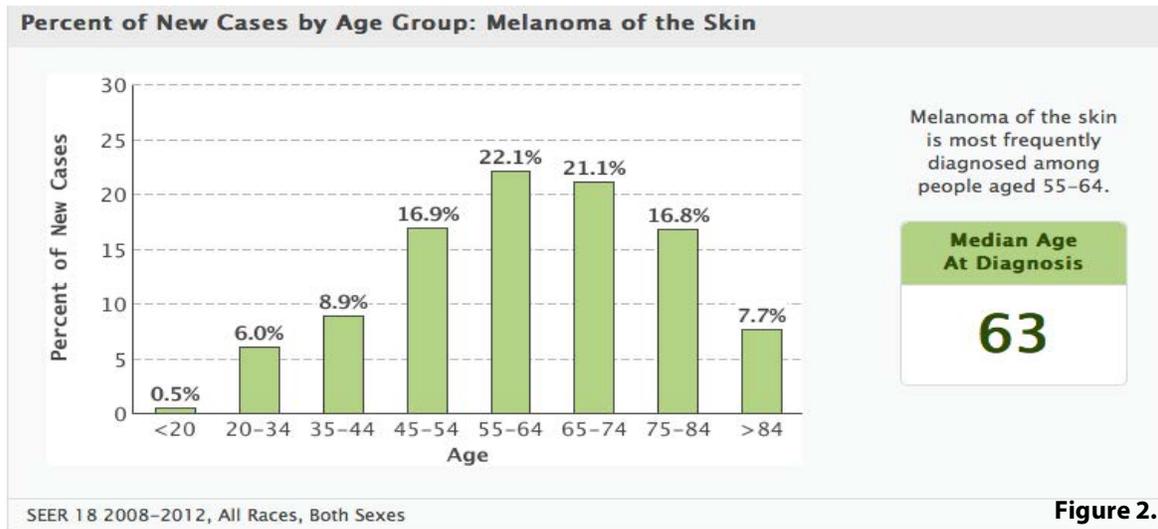
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14. Biologists sometimes say that “natural selection depends on the specific environment where a species lives.” What does this statement mean?
- If populations of a species are in different environments, traits that individuals need to meet their needs in each environment will appear.
 - Traits can be helpful or harmful. If populations of a species are in different environments, some traits that are helpful in one environment might be harmful in another environment.
 - Traits are always either helpful or harmful, and the environment of a population doesn't matter. If populations of a species are in different environments, the same traits will always be helpful.
 - Species were formed to perfectly match their environment. The traits of individuals in a species depend on the specific environment in which they were created.
15. Describe how UV light is harmful to people but can also be necessary.
16. How does the synthesis of melanin by melanocytes help these cells with their major function in skin?



17. The graph in Figure 2 summarizes the age at which people are diagnosed with melanoma, the most serious form of skin cancer.



Use the graph to explain why protection from skin cancer may not explain the strong selective pressure for dark skin in high-UV areas.